BaBar Beampipe Models

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Beampipe Models

¥ **Reco and Simulation use different models**

/ **BBSim = GEANT 3**

£ Fortran code

£ ASCI file geometry and material description
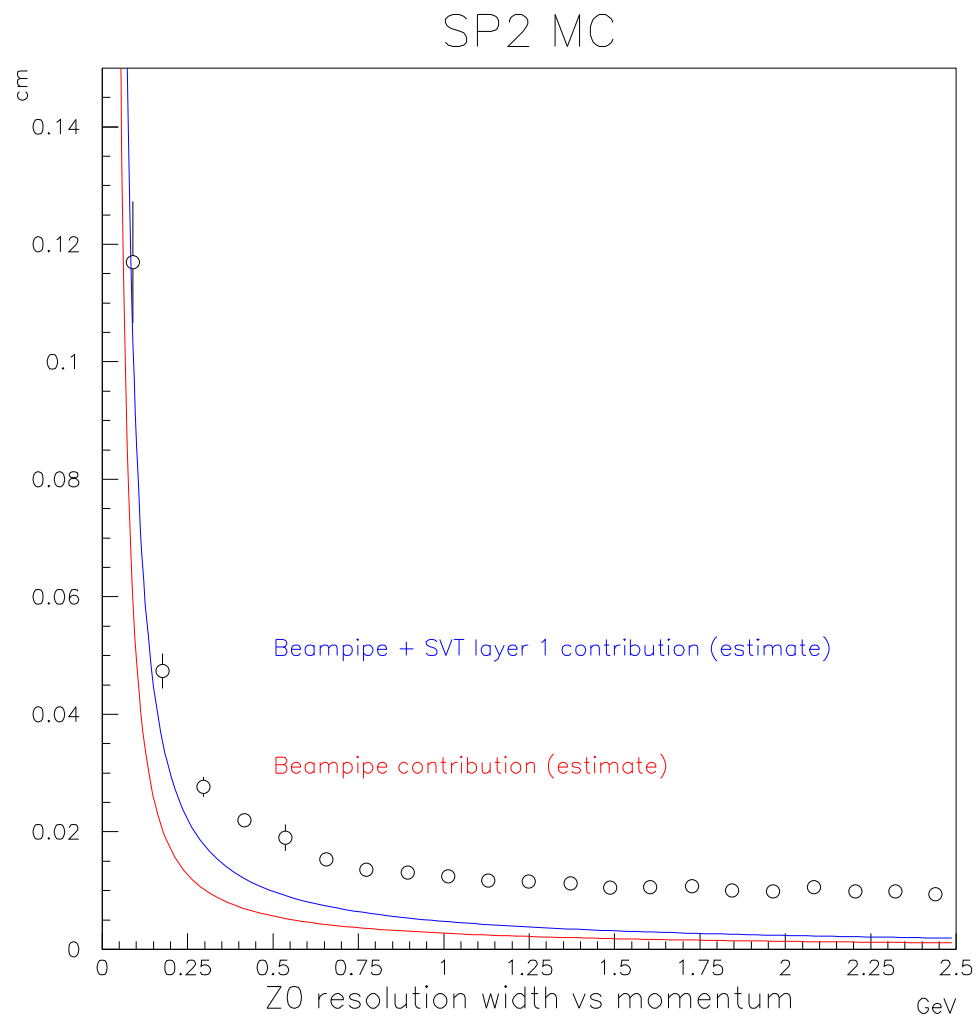
£ Material properties from Conditions Database

/ **Simulation = DetectorModel**

£ C++ code

£ Geometry and material description from Conditions Database

£ Material properties from Conditions DB (same as BBSim)

¥ **Two issues are relevant**

/ **Consistency between the reco and simulation models**

/ **Accuracy with respect to what's in IR2**

Why should anyone care?

SP2 MC

Beampipe + SVT layer 1 contribution (estimate)

Beampipe contribution (estimate)

Z0 resolution width vs momentum

Beampipe structure is compilcated

¥ **Many different layers**

/ **Be**

/ **Water (cooling)**

/ **Gold (RF/photon shield)**

/ **Ni (plating on water channel)**

/ **Epoxy (oxidation barrier)**

/ **Ta (only near flanges!)**

¥ **Structure changes with Z**

/ **Cooling channel changes shape**

/ **Outer radius increases**

/ **Tantalum foil, Aluminum, flanges, ...**

¥ **For more details see Bill Dunwoodie's recent work http://www.slac.stanford.edu/~wmd/beampipe/beampipe.material**

Model History (incomplete)

- ¥ **1996   Initial reconstruction model**
  - / **2.58 cm radius carbon cylinder, wall thickness = 1.92 mm**
    - £ X/X_0 = ~1%, dE/dx (min ion) ~ 0.8 MeV
  - / **Intended only to be a placeholder for the real model**
- ¥ **1997-1998   Simulation model updated**
  - / **Realistic model**
    - £ Gold, water channel, Ni, ...
  - / **R_{outer} = 2.835 cm**
- ¥ **March 2000   Reconstruction model updated (Matthias Steinke)**
  - / **Consistent with 1998 simulation model**
  - / **Material modeled as a single effective material**
    - £ Net admixture the same as the simulation composite
    - £ Faster than modeling as separate components

Model History (continued)

¥ **March 2000   Patrick Robbe**

   ⁄ R_{outer} **= 2.785 cm (in central region)**

      £ Simulation over-estimates amount of cooling water by 500 µm

¥ **April 2000   Bill Dunwoodie**

   ⁄ **Research beampipe as-built**

   ⁄ **Based on drawings, measurements, engineer's memories,…**

   ⁄ **Summarized in a 10-page document**

   ⁄ **Differences with BBSim model (used in SP#)**

      £ Cooling water over-estimated

      £ Epoxy and SVT RF shield missing

      £ X/X_0 overestimated by ~0.1%

      £ dE/dx (min ion) by ~ 0.1 MeV

What are we doing now?

- ¥ **Reco and Simulation have agreed on a final model**
  - ∕ **4 sections in Z**
    - £ Out to flange
    - £ Includes Tantalum
  - ∕ **No Azimuthal structure**
- ¥ **Reco and Simulation will (eventually) share code**
  - ∕ **Common parts will live in a common package**
    - £ Modeled on how SVT Geometry is shared
  - ∕ **Will only happen after Bogus is released**
    - £ BBSim will not be updated
- ¥ **Reco will implement the new model soon**
  - ∕ **Bill + Matthias have calculated the material**
  - ∕ **Data will be introduced in the DB (valid for real data)**
  - ∕ **New code will live in the TrkGeom package (Matthias)**

Conclusions

- ¥ **It's taken a long time to get the beampipe models both accurate and consistent**
- ¥ **The SP# simulation is not accurate**
  - ∕ **The differences with as-built are small**
- ¥ **The reconstruction model will be updated soon**
  - ∕ **Post-summer reconstruction and reprocessing**
- ¥ **The simulation model will be updated after Bogus is released**
  - ∕ **Conditions DB will follow the time dependence**
  - ∕ **Common software will be shared**